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July 28, 2000

EX PARTE

Ms. Magalie Roman Salas
Secretary
Federal Communications Commission
The Portals
445 12th Street, S.W.
Washington, D.C. 20554

Re: CC Docket No. 98-56 and CC Docket No. 98-121

Dear Ms. Salas:

On July 28, 2000, Ed Mulrow of Ernst & Young and I, representing BellSouth, met with Katherine Farroba and Daniel Shiman, of the Common Carrier Bureau's Policy and Program Planning Division, and Alex Belinfante, and Ben Childers of the Bureau's Industry Analysis Division. Venetta Bridges of BellSouth participated in the meeting by telephone. During this meeting, we discussed the role of the parameters δ, ψ, and ε in the determination of the alternative hypothesis to be used in determining when parity exists under the BellSouth VSEEMs-III plan. We also discussed the reasonableness of defining the volume of missed transactions on which payment would be made by dividing the parity gap by 4 when the parity gap itself was less than 4. The attached documents formed the basis for BellSouth's presentation.

In accordance with Section 1.1206, I am filing two copies of this notice in both of the proceedings identified above. Please place this notice in the records of both.

Sincerely,

Kathleen B. Levitz

Kathleen B. Levitz

Attachment

cc: Katherine Farroba (w/o attachment)
Daniel Shiman (w/o attachment)
Alex Belinfante (w/o attachment)
Ben Childers (w/o attachment)

Percent Missed Installations
Louisiana
November 1999

Test	Parity Gap	VSEEM III Method Volume Proportion	VSEEM III Method Transactions Paid	Linear Program Method Volume Proportion	Linear Program Method Transactions Paid	Difference VSEEM - LP
1	0.39	0.10	1	0.25	1	0
2	0.82	0.21	7	0.06	2	5
3	0.94	0.24	1	0.25	1	0
4	0.96	0.24	1	1.00	1	0
5	1.03	0.26	1	0.50	1	0
6	1.20	0.30	3	0.20	1	2
7	1.45	0.36	3	0.33	2	1
8	1.46	0.37	2	0.40	2	0
9	1.53	0.38	2	0.25	1	1
10	1.64	0.41	1	1.00	1	0
11	1.65	0.41	1	0.50	1	0
12	2.01	0.50	12	0.19	4	8
13	2.22	0.56	3	0.25	1	2
14	2.49	0.62	17	0.24	6	11
15	2.59	0.65	30	0.20	9	21
16	2.69	0.67	3	0.67	2	1
17	2.72	0.68	18	0.24	6	12
18	2.76	0.69	3	0.75	3	0
19	3.32	0.83	58	0.19	13	45
20	3.49	0.87	7	0.43	3	4
21	3.58	0.90	11	0.42	5	6
22	3.61	0.90	14	0.43	6	8
23	3.75	0.94	49	0.17	8	41
24	4.04	1.00	14	0.29	4	10
25	4.20	1.00	30	0.33	10	20
26	4.43	1.00	15	0.47	7	8
27	4.71	1.00	32	0.38	12	20
28	4.80	1.00	26	0.38	10	16
29	4.95	1.00	34	0.35	12	22
30	4.97	1.00	19	0.47	9	10
31	6.24	1.00	35	0.40	14	21
32	7.96	1.00	92	0.35	32	60
33	9.03	1.00	24	0.58	14	10
34	9.23	1.00	8	0.88	7	1
35	9.76	1.00	1	1.00	1	0
36	11.87	1.00	17	0.76	13	4
37	13.55	1.00	18	0.78	14	4
38	17.71	1.00	33	0.79	26	7
39	18.69	1.00	168	0.52	87	81

Linear Program method solves for the number of missed transactions to be paid, and creates a volume proportion by dividing by the number of missed transactions in negative cells.
This volume proportion is created for comparison with that of the VSEEM III method.

VSEEM III finds the volume proportion by dividing the parity gap by 4 when the parity gap is less than 4, and sets the volume proportion to 1 otherwise. The number of missed transactions to be paid is found by multiplying the number of transactions in negative cells by the volume proportion.

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Parity Hypotheses

Interpretation and Examples

July 27, 2000

The Null Hypothesis

- The Null Hypothesis, H_o, is that parity exists between ILEC and CLEC services
  - Mean Measure
    - $\mu_{ILEC} = \mu_{CLEC}$ and $\sigma_{ILEC} = \sigma_{CLEC}$
  - Rate Measure
    - $r_{ILEC} = r_{CLEC}$
  - Proportion Measure
    - $p_{ILEC} = p_{CLEC}$

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The Alternative Hypothesis

- The alternative hypothesis, H_a, is that the ILEC is giving better service to its own customers
- Assuming better service means a lower value for a performance measure
  - Mean Measure
    - $\mu_{ILEC} < \mu_{CLEC}$ or $\sigma_{ILEC} < \sigma_{CLEC}$
  - Rate Measure
    - $r_{ILEC} < r_{CLEC}$
  - Proportion Measure
    - $p_{ILEC} < p_{CLEC}$

Evaluating Type I & II Error Probabilities

- Type I Error Probability is based on the distribution of test statistic under the Null Hypothesis
- Type II Error Probability is based on the distribution of test statistic under the Alternative Hypothesis
  - Since H_a is a composite hypothesis, Type II error probability is calculated at specific realizations of H_a
  - It helps to restate H_a in terms of parameters, the specific form depends on the distribution of the test statistic under H_a

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Mean Measures

- Basic Test Statistic -- the modified Z

$$Z = \frac{\bar{X}_{ILEC} - \bar{X}_{CLEC}}{\sigma_{ILEC}\sqrt{\frac{1}{n_{ILEC}} + \frac{1}{n_{CLEC}}}}$$

- Standard Normal Distribution under H_o

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Mean Measure

- Parameterize H_a with δ, the number of ILEC standard deviations that the CLEC mean is above the ILEC mean
  - H_a: $\mu_{CLEC} = \mu_{ILEC} + \delta \cdot \sigma_{ILEC}$, $\delta > 0$
    - Note that we require the two variances to be equal under H_a
- Modified Z statistic has a Normal distribution with mean

$$\frac{-\delta}{\sqrt{\frac{1}{n_{ILEC}} + \frac{1}{n_{CLEC}}}}$$

and standard error 1

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H_a Interpretation Mean Measure

- Example: Let $\delta = 0.5$
  - Under this alternative
    - $\sigma_{ILEC} = 0.5$, then $\mu_{CLEC} - \mu_{ILEC} = 0.25$
    - $\sigma_{ILEC} = 2.0$, then $\mu_{CLEC} - \mu_{ILEC} = 1.00$
    - $\sigma_{ILEC} = 8.0$, then $\mu_{CLEC} - \mu_{ILEC} = 4.00$
- Example: Let $\delta = 1$
  - Under this alternative
    - $\sigma_{ILEC} = 0.5$, then $\mu_{CLEC} - \mu_{ILEC} = 0.50$
    - $\sigma_{ILEC} = 2.0$, then $\mu_{CLEC} - \mu_{ILEC} = 2.00$
    - $\sigma_{ILEC} = 8.0$, then $\mu_{CLEC} - \mu_{ILEC} = 8.00$

Balancing

- In order to balance Type I and II Error probabilities, we choose a reference parameter of the alternative and determine a critical value for the test that provides equal error probabilities
  - For a mean measure we choose a specific value of δ, e.g. BellSouth has chosen $\delta = 1$
- It is not the case that there will be no parity failures unless the actual difference in service goes beyond the balancing alternative
  - We are still testing for any difference in performance

Power of a Test

- The power of a statistical test is the probability that the test rejects the null hypothesis given the true nature of the hypothesis' parameter
  - For a mean measure, this is the P($Z^T < c_B$) when the μ_{CLEC}-μ_{ILEC}= $\delta\sigma_{ILEC}$ for each $\delta >= 0$
    - When $\delta = 0$, the power is the Type I Error probability
    - For all other values of $\delta > 0$, the power is the complement of the Type II Error probability
- There is often a significant probability that there will be a parity test failure for values of δ less than the balancing reference point, δ_a

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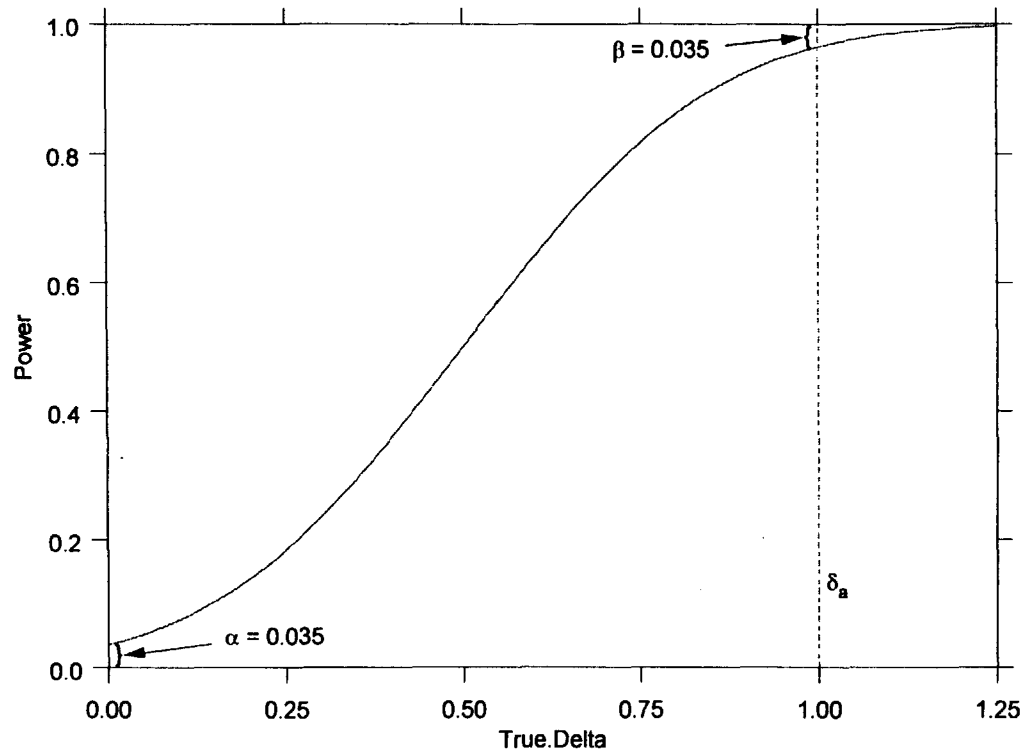
Power of a Test Example

Power Curve of a Mean Measure Test Based on the Modified Z, and Balanced at the alternative $\delta_a = 1$



$n_{ILEC}=100$, $n_{CLEC}=15$

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Mean Measure

Mean Measure Cell Standard Deviations
Louisiana 1999

	Mainentance Average Duration[1]			Order Completion Inverval[2]		
	September	October	November	September	October	November
Min	0.00	0.09	0.18	0.00	0.00	0.00
Q1	11.45	13.04	10.88	0.97	1.04	1.07
Median	17.13	19.49	18.06	1.87	1.99	2.13
Mean	16.31	18.63	16.60	1.35	1.41	1.41
Q3	21.70	25.55	23.11	2.12	2.04	2.22
Maximum	64.97	91.96	136.95	27.33	69.31	22.18

[1] Hours

[2] Days

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Rate Measures

- Basic Test Statistic $$Z = \frac{n_{ILEC} - n}{\sqrt{n\, q(1-q)}}$$

  where $n = n_{ILEC} + n_{CLEC}$, and q is the relative proportion of ILEC elements, e.g., the proportion of ILEC lines in service (b_{ILEC}) compared to all lines in service, ($b=b_{ILEC}+b_{CLEC}$)

- Under H_o, n_{ILEC} has a binomial distribution with parameters n and q
  - The mean and standard error of Z are 0 and 1 respectively

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Rate Measure

- Parameterize H_a with ε, the ratio of the CLEC rate to the ILEC rate
  - H_a: $r_{CLEC} = \varepsilon\, r_{ILEC}$, $\varepsilon > 1$
- n_{ILEC} has a binomial distribution with parameters n and

$$q^* = \frac{b_{ILEC}}{b_{ILEC} + \varepsilon\, b_{CLE}}$$

  - The mean and standard error of Z are

$$(1-\varepsilon)\frac{\sqrt{nb_{ILEC} b_{CLEC}}}{b_{ILEC} + \varepsilon\ b_{CLEC}} \text{ and } \sqrt{\varepsilon}\,\frac{b}{b_{ILEC} + \varepsilon\ b_{CLEC}}$$

respectively

H_a Interpretation Rate Measure

- Example: Let $\varepsilon = 3$
  - Under this alternative
    - $r_{ILEC} = 0.01$, then $r_{CLEC} = 0.03$
    - $r_{ILEC} = 0.10$, then $r_{CLEC} = 0.30$
    - $r_{ILEC} = 0.50$, then $r_{CLEC} = 1.50$
- Example: Let $\varepsilon = 6$
  - Under this alternative
    - $r_{ILEC} = 0.01$, then $r_{CLEC} = 0.06$
    - $r_{ILEC} = 0.10$, then $r_{CLEC} = 0.60$
    - $r_{ILEC} = 0.50$, then $r_{CLEC} = 3.00$

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Rate Measure

ILEC TROUBLE REPORT RATES *
LOUISIANA 1999

Statistic	OCTOBER	NOVEMBER	DECEMBER
Minimum	0.000	0.000	0.000
1st Quartile	0.013	0.010	0.011
Median	0.025	0.020	0.021
Mean	0.031	0.026	0.025
3rd Quartile	0.038	0.032	0.033
Maximum	0.471	0.398	0.333

*Number of Troubles per active service line

Proportion Measures

- Basic Test Statistic

$$Z = \frac{n \, a_{ILEC} - n_{ILEC} \, a}{\sqrt{\dfrac{n_{ILEC} \, n_{CLEC} \, a \, (n - a)}{n - 1}}}$$

where $n = n_{ILEC} + n_{CLEC}$, a_{ILEC} is the number of ILEC transactions with an attribute of interest, and $a = a_{ILEC} + a_{CLEC}$

- Under H_o, a_{ILEC} has a hypergeometric distribution with parameters n, n_{ILEC} and a
    - The mean and standard error of Z are 0 and 1 respectively

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Proportion Measure

- Parameterize H_a with ψ, the odds ratio
  - H_a: $\dfrac{p_{CLEC}(1-p_{ILEC})}{(1-p_{CLEC})p_{ILEC}} = \psi, \psi > 1$
  - Note: $p_{CLEC} > p_{ILEC}$ if and only if the odds ratio is greater than 1
  - The parity null hypothesis is equivalent to the odds ratio equaling 1
- Under H_a with $\psi > 1$, a_{ILEC} has an extended hypergeometric distribution
- The formulae for the mean and standard error of Z are complex. They are given in Appendix C of the Louisiana Statistician's Report

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Odds Ratio

- The Odds Ratio is the ratio of the relative risk (or odds) of a CLEC "missed transaction" to the relative risk of an ILEC "missed transaction"
- Odds = P(miss)/P(no miss)
  - An Odds Ratio of 2 means the odds of a CLEC customer having a "missed transaction" is twice that of an ILEC customer
  - This does not mean that a CLEC customer has twice the change of having a "missed transaction" than an ILEC customer

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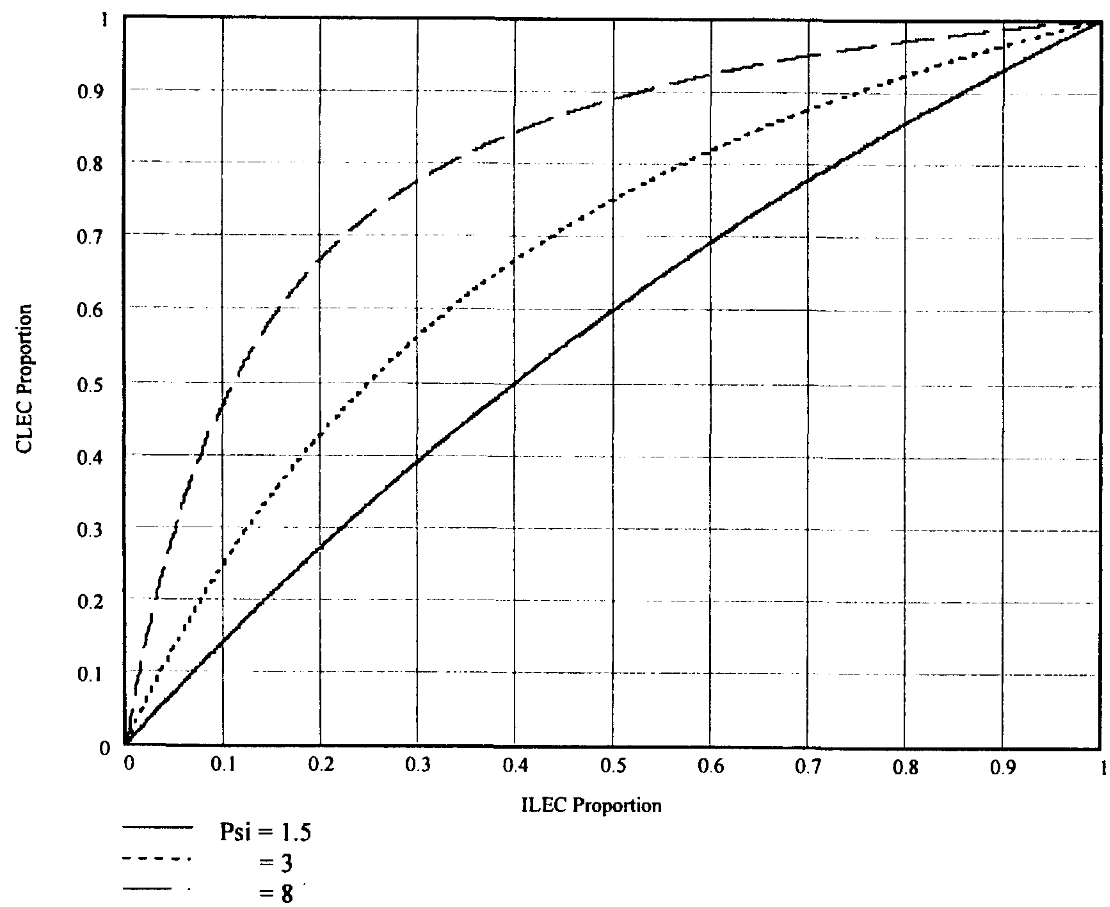
Odds Ratio

Relationship Between ILEC and CLEC Proportions by Odds Ratio



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H_a Interpretation Proportion Measure

- Example: Let $\psi = 3$
  - From the previous graph, we see that when
    - $p_{ILEC} = 0.10$, then $p_{CLEC} = 0.25$
    - $p_{ILEC} = 0.40$, then $p_{CLEC} = 0.67$
    - $p_{ILEC} = 0.70$, then $p_{CLEC} = 0.88$
- Example: Let $\psi = 8$
  - From the previous graph, we see that when
    - $p_{ILEC} = 0.10$, then $p_{CLEC} = 0.47$
    - $p_{ILEC} = 0.40$, then $p_{CLEC} = 0.84$
    - $p_{ILEC} = 0.70$, then $p_{CLEC} = 0.95$

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Proportion Measure

ILEC PROPORTION MEASURES

LOUISIANA 1999

	Missed Installations			*Missed Repairs*		
Statistic	October	November	December	October	November	December
Minimum	0	0	0	0	0	0
1st Quartile	0	0	0	0.03333	0.02598	0.01869
Median	0	0	0	0.08602	0.08	0.07692
Mean	0.03104	0.03288	0.03785	0.118	0.1118	0.116
3rd Quartile	0	0	0	0.1667	0.1538	0.1667
Maximum	1	1	1	1	1	1

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Relationships Between Alternative Parameters

- Colin Mallows has constructed statistical relationships between the δ parameter for mean measures and the values of the proportions and rates

$$\delta = 2 \cdot \arcsin(\sqrt{p_{CLEC}}) - 2 \cdot \arcsin(\sqrt{p_{ILEC}})$$

$$\delta = 2\sqrt{r_{CLEC}} - 2\sqrt{r_{ILEC}}$$

- These relationships assume that the concept of a "meaningful" difference in performance is equivalent across the different measure types

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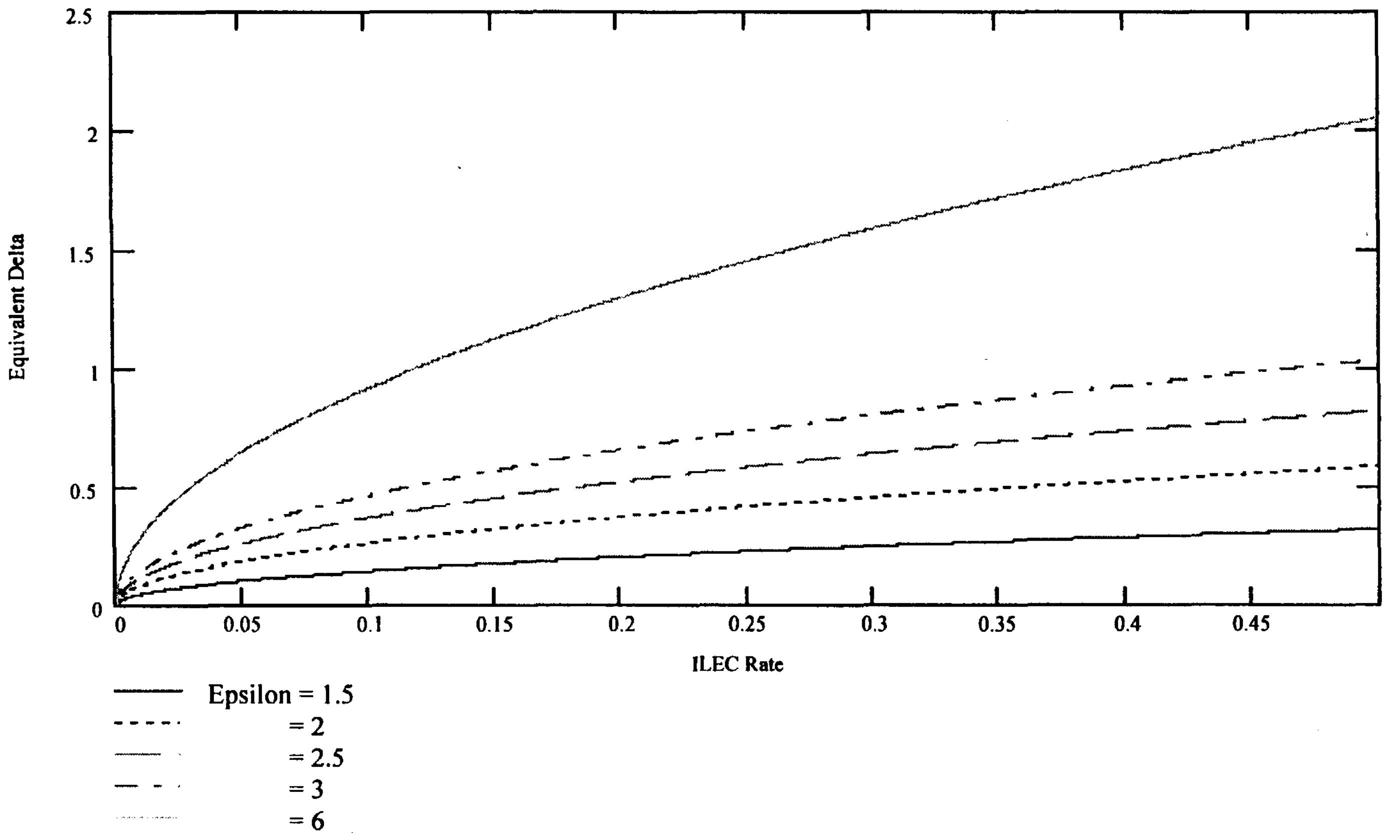
Relationship Between ε and δ

Equivalent Delta vs. ILEC Rate by Epsilon



Relationship Between ψ and δ

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Equivalent Delta vs. ILEC Proportion by Psi